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Debts and Deficits with Fragmented Fiscal Policymaking

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Debts and Deficits with Fragmented Fiscal Policymaking[1]

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Abstract

This paper develops a political-economic model of fiscal policy –one in which government resources are a "common property" out of which interest groups can finance expenditures on their preferred items. This setup has striking macroeconomic implications. Transfers are higher than a benevolent planner would choose them to be; fiscal deficits emerge even when there are no reasons for intertemporal smoothing, and in the long run government debt tends to be excessively high; peculiar time profiles for transfers can emerge, with high net transfers early on giving rise to high taxes later on; and multiple dynamic equilibrium paths can occur starting at the same initial level of government debt. *JEL Classification Numbers: H3, H6, E6. Key Words: fiscal policy, fragmentation, decentralization, local public goods, debt.*

1 Introduction

Many countries of the world –both OECD economies and developing countries such as those in Latin America[1]– have systematically run budget deficits since 1973, and this has often led to unsustainable debt accumulation. In some extreme cases, such as those of Mexico, Argentina and Bolivia in the 1980s, drastic changes in spending and taxes were eventually required to restore solvency. In other serious but less dramatic cases –such as those of Belgium and Italy, where the public debt is above 100 percent of GNP and growing– lasting fiscal stabilization is yet to occur.

This phenomenon is not easy to reconcile with the neoclassical model [Barro, 1979] that views debt accumulation as a way to spread over time the costs of distortionary taxation. While the neoclassical model fits the U.S. data reasonably well [Barro, 1986], cyclical and intertemporal smoothing factors cannot fully account for the recent increase in peacetime deficits in OECD countries [Roubini and Sachs, 1989].[2] Furthermore, the tax-smoothing model does not seem to fit the budget data from developing countries [Edwards and Tabellini, 1991; Roubini, 1991].

Hence, the recent fiscal policy of many countries implies a "deficit puzzle." This paper presents a model of "fragmented fiscal policymaking" that offers an explanation for the apparently puzzling behavior of debts and deficits. Rather than focusing on a representative individual and a benevolent policymaker bent on maximizing the individual's welfare, I instead consider a society divided into several influential interest groups, each of which benefits from a particular kind of government spending. The government is assumed to be weak, in that each of the interest groups can influence fiscal authorities to set net transfers on the group's target item at some desired level. Finally, a key assumption is that all interest groups share the same budget constraint, enjoying "common access" to government resources.

This policymaking regime can be interpreted in one of several ways, all of which have counterparts in countries' recent experience. First, spend-

[1] On the OECD, see Alesina and Perotti [1994]. The fiscal experience of a number of Latin American countries is also reported and analyzed in Tornell and Velasco [1995] and references therein. See also the essays in Larraín and Selowsky [1991].

[2] Bizer and Durlauf [1990] argue that U.S. tax rates do not seem to be a random walk, as implied by the theory. Rather, they find an eight-year cycle for tax changes, a feature suggestive of a political equilibrium.

ing pressures may arise from sectoral ministers or parliamentary committees with special interests that overwhelm a weak Finance Minister. In a detailed set of studies of the European Community in the 1970's and 1980's, von Hagen [1992] and Von Hagen and Harden [1994] conclude that budgeting procedures that lend the finance minister "strategic dominance over spending ministers" and "limit the amendment powers of parliament" are strongly conducive to fiscal discipline. The opposite arrangement often leads to sizeable deficits and debts.[3] The three countries with weakest budgetary procedures (those with the weakest finance minister, most parliamentary amendments, etc.) had deficits that averaged 11 percent of GDP in the 1980s, while the three countries with the strongest procedures had deficit ratios of 2 percent. The accumulated public debt stocks were also very different between these two sets of countries.[4] Similar results are reported by Alesina, Hausmann, Hommes and Stein [1996] in their study of 20 Latin American and Caribbean countries. Using a methodology quite similar to that of Von Hagen, they find that the 6 countries with the strongest fiscal processes had, between 1980 and 1993, fiscal surpluses that averaged 1.8 percent of GDP; the 7 countries with the weakest processes had deficit ratios of 2.2 percent over the same period.

Second, spending may be set by decentralized fiscal authorities representing particular geographical areas. The cases of Argentina and Brazil are instructive.[5] They are both federal countries in which over the last two decades many spending responsibilities have been transferred to the subfederal level. Lacking sufficient revenues of their own and facing unclear rules, sub-federal governments have systematically run deficits which de facto have become the responsibility of the federal authorities. There have generally been three mechanisms through which state and provincial entities could

[3]More specifically, Von Hagen [1992] constructs an index characterizing E.U. national budget processes on four grounds: a) strength of the Prime Minister of Finance Minister in budget negotiations; b) existence of overall budget targets fixed early on and limits on parliamentary powers of amendment; c) transparency of the budget document; and d) limited discretion in the implementation of the budget.

[4]More generally, Roubini and Sachs [1988, 1989] and Grilli, Masciandaro and Tabellini [1991] have shown that among OECD countries, those with proportional representation and fractionalized party systems tend to display high deficits and debt.

[5]The case of Argentina is studied in Jones, Sanguinetti and Tommasi [1997] and World Bank [1990a b and c], and that of Brazil in Shah [1990] and Bomfin and Shah [1991]. Stein, Talvi and Grisanti [1997] discuss fiscal arrangements at the subnational level for all of Latin America and the Caribbean.

"pass on" their deficits: a) borrowing from state development banks which in turn could rediscount their loans at the Central Bank –in effect monetizing the sub-federal deficits; b) obtaining discretionary lump sum transfers from the federal government, generally requested around election time and after large debts had been accumulated; and c) accumulating arrears with suppliers and creditors, which (for either legal or political reasons) were eventually cleared up by the federal authorities. Understanding that at least part of the cost would be borne by others, sub-federal governments have been tempted to overspend and overborrow. Similar troubles affected the former Yugoslavia. They are also becoming increasingly severe in Russia, as Wallich [1992] and Sachs [1994] argue.

Third, transfers may be determined by money-losing state enterprises facing soft budget constraints –for instance in Mexico and Brazil in the 1970s or in Russia and some countries of Eastern Europe more recently. As Kornai [1979] emphasized, state firms have an incentive to pay excessive wages (thus simply reducing the profit stream that would go to the Treasury) and engage in large and risky investments (managers benefit from running larger firms but bear none of the investment risk). Bankruptcy is not a real threat, as government subsidies and bailouts from state banks often extend the life of distressed firms. Lipton and Sachs [1990], among others, have pointed out this problem became increasingly acute with the decline of communism and the beginning of transition. Holzmann [1991] estimates that in Eastern Europe during the 1980s budgetary subsidies to state enterprises averaged almost 10 percent of GDP. In Cuba in 1994, such subsidies reached 21 percent of GDP.

The inefficiencies that arise when several groups or officials with redistributive aims have control over fiscal policy have been recognized in the literature. Weingast, Shepsle and Johnsen [1981] and, more recently, Cole and Chari [1993c] and Chari, Jones and Marimon [1994] have shown that having the supply of local public goods financed with national or federal revenues creates incentives for pork barrel spending. Aizenman [1991] and Zarazaga [1993] have argued that if fiscal and/or monetary policy are decided upon in a decentralized manner, a "competitive externality" arises which gives the economy an inflationary bias. What all these models have in common is that, because the benefits from spending accrue fully to each group, while the costs are spread over all groups, incentives are distorted and a "spending bias" emerges.

As Alesina and Perotti [1994] stress, however, the models in the literature so far are essentially static, focusing on the level of expenditures rather than on the behavior of debt and deficits.[6] This paper, by contrast, focuses on the dynamic aspects of fragmented fiscal policymaking in the context of an infinite horizon model. Fiscal authorities are confronted with an explicit intertemporal trade-off: high deficits today mean lower spending or higher taxes tomorrow. Does a divided government structure lead rational fiscal authorities to run debts and deficits that are "too high" in some well defined sense? The model below provides an affirmative answer to this question. If government net assets (the present value of future income streams minus outstanding debts) is the common property of all fiscal authorities, then a problem arises that is logically quite similar to the "tragedy of the commons" that occurs in marine fisheries or public grazing lands [Levhari and Mirman, 1980; Benhabib and Radner, 1993].

Two distortions are present if n agents share the stock of the resource. First, each uses the whole stock and not one-nth of it as the basis for consumption or spending decisions. Second, the return on savings as perceived by one agent is the technological rate of return (the rate of interest or the rate of growth of natural resource stocks) minus what the other $n-1$ agents take out. Hence, to the extent that savings depends positively on the rate of return, each agent undersaves (overspends in the case of fiscal policy, overexploits in the case of natural resources). This means that deficits are incurred and debts accumulated even in contexts where there is no incentive for intertemporal smoothing, so that a central planner guiding fiscal policy would run a balanced budget. In short, and in contrast to earlier work, the model exhibits a "deficit bias."[7]

A related implication of the model is that long-run levels of public debt are –in some equilibria constructed below – higher than those that would be chosen by a benevolent planner. In one case, deficits and debt accumulation

[6] A partial exception is Cole and Chari [1993c], who consider a two-period model.

[7] Of course, this is not the only type of political economy story that can yield a deficit bias. An important alternative explanation is provided by Persson and Svensson [1989] and Tabellini and Alesina [1990]. In their models, society is divided into groups with different preferences (over the composition of government spending, for instance). Because current majorities know that in the future a different majority with different preferences may be in control of fiscal policy, those currently in power attempt to "bind" the actions of their successors by leaving them a large public debt.

continue until the government reaches its debt ceiling.

The time path of spending and deficits is interesting. Along some equilibrium paths transfers are positive and high for large stocks of government wealth, but shrink and eventually become negative (groups begin to pay taxes) as government wealth becomes smaller. When the trajectory involves hitting the credit ceiling, debt accumulation stops when the ceiling is reached, and interest groups are stuck servicing the debt via high taxes forever thereafter.

There can also be multiple equilibrium paths for arbitrary initial conditions and some ranges of parameter values. It could happen, for instance, that if one group expects other groups to seek high transfers its best response is to do the same, thus placing the economy on a trajectory in which sustained fiscal deficits occur and the government eventually reaches its credit ceiling; but if one group expects others to seek small transfers it may be optimal to respond by also seeking small transfers –in which case balanced fiscal accounts or even surpluses occur in equilibrium. For some parameter values, which equilibrium occurs depends only on "animal spirits."

The paper is structured as follows. Section 2 sets up the basic model, while Section 3 characterizes the benevolent planner's solution to the relevant fiscal policy problem. Sections 4 rules out the possibility of extreme equilibria in which groups transfer at the maximum feasible rate. Sections 5, 6 and 7 constitute the core of the paper: there I characterize an equilibrium in which fragmented fiscal policy-making leads to a "deficit bias" relative to the planner's solution. Section 8 offers a summary and some conclusions.

2 The Basic Model

There are $n > 1$ symmetric groups, indexed by $i, i = 1, 2, ..., n$. Each can be thought of as a particular constituency or recipient of government largesse. Net transfers to group i –denoted by g_i– can be interpreted as subsidies to its members minus the taxes that group pays, or net spending on a public good that only benefits those in group i. Hence, g_i can be positive or negative. In addition there is a maximum transfer (denoted by $\overline{g} > 0$) and a minimum transfer (denoted by $-\bar{g}$) that can be made to any group. Notice that since that minimum transfer is negative, it is in fact the maximum tax that can be levied. This maximum tax could exist because of political constraints not modeled here, or simply because each group's own resources are finite.

Any excess of expenditure over revenues can be financed by borrowing in the world capital market at a constant real rate r, which is exogenous given the assumption that the economy is small and open. Accumulated debts are a joint liability of all n groups, as would be the case with the national debt in any country. The government budget constraint therefore is

$$\dot{b}_t = rb_t + y - \sum_{i=1}^{n} g_{it} \tag{1}$$

where y denotes exogenous non-tax government revenue (e.g., income from state enterprises or transfers from abroad) and b_t is the stock of the internationally traded bond held by the government at time t, which can be interpreted as the gross international reserves minus outstanding public debt –both earning or paying the interest rate r.[8]

As is usual in this kind of setting, I impose on the government the solvency condition

$$\lim_{t\to\infty} b_t e^{-rt} \geq 0 \tag{2}$$

which prevents unbounded debt growth.[9]

If we define non-tax government wealth (hereafter government wealth for simplicity) as $w_t \equiv b_t + \frac{y}{r}$, constraint 1 can be written as

$$\dot{w}_t = rw_t - \sum_{i=1}^{n} g_{it} \tag{3}$$

which is the expression I shall use from now on.

How do groups interact in order to determine fiscal policy? The key assumption is that the central fiscal authority is weak, and that group i itself can determine the sequence $\{g_{it}\}_{t=0}^{\infty}$. While each group has many members,

[8] As usual with continuous time formulations, care must be exercised to ensure that law of motion 1 is well defined for all relevant levels of w_t. For a discussion of this issue in the context of related differential games, see Benhabib and Radner [1992] and Friedman [1971].

[9] Throughout I abstract from the issue of default on outstanding government obligations, which is clearly beyond the scope of this paper. The standard literature on optimal debt management –for instance Barro [1979] also neglects the issue of default. For important papers that study default explicitly in related contexts, see Bulow and Rogoff [1989], Atkeson [1991] and Chari and Kehoe [1993a and b].

they act in a coordinated fashion (through a congressional leader or member of the cabinet, for example) in setting the level of net transfers g_{it}.

The leader of group i maximizes the objective function

$$U_{it} = -\left(\frac{1}{2}\right)\int_t^\infty \left\{(\bar{g} - g_{is})^2 + \psi r^2\left(w_s - \frac{n\bar{g}}{r}\right)^2\right\} e^{-r(s-t)} ds \tag{4}$$

with respect to g_{it} starting at each time $t > 0$, subject to 1 (or, equivalently, 3) and 2. I assume a quadratic formulation in order to get closed-form solutions to the dynamic games that follow. Notice also that the subjective rate of time discounting has been set equal to the world interest rate in order to abstract from the conventional reasons for borrowing and debt accumulation.

Groups' utility is a decreasing function of the gap between the actual net transfer they receive and a bliss level $\bar{g}$ (notice that, for simplicity, this bliss level and the maximum transfer are assumed to be the same). Utility also declines the larger is the gap between the actual wealth level w_t and the level $\frac{n\bar{g}}{r}$ which would ensure that all n groups receive the bliss level of transfers; this latter objective has weight $\psi r^2 \geq 0$.[10] Notice that this formulation implies that U_i is concave in g_{it} as long as $g_{it} \leq \bar{g}$; satisfaction of this condition is ensured by the fact that $\bar{g}$ is also the maximum transfer level. The function U_i is also concave in w_t as long as $w_t \leq \frac{n\bar{g}}{r}$, a condition which will be satisfied along all candidate equilibrium paths below.

Finally, some remarks about government wealth are in order. We must ensure that at the start the government is rich enough to be solvent, but poor enough to make the story interesting. The assumption that $-\frac{n\bar{g}}{r} < w_0 < \frac{n\bar{g}}{r}$ guarantees exactly that. Notice also that, given the assumption of a maximum tax per group equal to $-\bar{g}$, the level $-\frac{n\bar{g}}{r}$ constitutes minimum allowable government wealth. Beyond that no lender would advance additional resources to the government, for clearly the value of its debts would exceed the present value of its maximum tax revenue. Therefore, the debt level $b = -\frac{n\bar{g}+y}{r}$ constitutes the maximum debt level or, equivalently, the country's credit ceiling. At that point credit rationing sets in, forcing the groups to reduce the transfers they exact and causing a stabilization in the growth of government debt.

Notice that once government wealth reaches $-\frac{n\bar{g}}{r}$ (or, equivalently, debt reaches $-\frac{n\bar{g}+y}{r}$) it is stuck there: building wealth back up would require

[10] Including the term r^2 is just an algebra-simplifying normalization.

transfers that were smaller (more negative) than $-\bar{g}$; transfers larger than $-\bar{g}$ would cause debt to accumulate further; clearly, neither situation is feasible. In other words, wealth level $-\frac{n\bar{g}}{r}$ is an absorbing state.[11]

If starting at some time T, government wealth reaches $-\frac{n\bar{g}}{r}$ (and remains there forever, implying that each group pays taxes equal to $-\bar{g}$ forever), group utility as of that time is

$$U_{iT}^{r} = -\left(\frac{2}{r}\right)\left(1 + n^2\psi\right)\bar{g}^2 \tag{5}$$

where the superscript "r" stands for "rationing."

Equations 3, 2 and 4, plus the assumed initial condition on wealth and the bounds on feasible transfers, provide the setting for a dynamic game among the leaders of the n groups.

3 The Benevolent Planner's Policy

Before constructing equilibria for that game, however, it is useful to ask about the level of transfers that would be chosen by a benevolent planner that maximized the joint welfare of all groups (with equal weights for each). In this situation in which all the groups become symmetric, such a planner would maximize 4 subject to 2, to

$$\dot{w}_t = rw_t - ng_{it} \tag{6}$$

and to $w_0 > 0$ given. The solution to that standard optimal control problem is

$$g_{it} - \bar{g} = \gamma\left(rw_t - n\bar{g}\right)\ \forall t \geq 0 \tag{7}$$

where $\gamma \equiv \frac{1+\sqrt{1+4n\psi}}{2n}$. Notice that $\gamma = \frac{1}{n}$ if $\psi = 0$, and $\gamma > \frac{1}{n}$ if $\psi > 0$. Plugging this transfer rule into the budget constraint 6 yields

$$\dot{w}_t = r\left(1 - n\gamma\right)\left(w_t - \frac{n\bar{g}}{r}\right) \tag{8}$$

If $\psi = 0$, so that the level of debt does not enter group preferences, $1 - n\gamma = 0$; the budget is always balanced and government wealth is constant

[11] Again, this whole discussion makes sense only if default is assumed away.

throughout. This is simply an expression of the principles of public debt management developed by Barro [1979]: since the rate of interest equals the rate of subjective discounting and government non-interest income is flat over time, there are no transfer-smoothing reasons for debt accumulation.

But if $\psi > 0$, so that the actual level of debt does enter group preferences, $1 - n\gamma < 0$. In that case, there is a budget surplus and $\dot{w}_t > 0$ as long as $w_t < \frac{n\bar{g}}{r}$. Once the bliss level of wealth $w = \frac{n\bar{g}}{r}$ has been achieved, the budget goes into balance and government wealth remains constant thereafter.

4 On the Non-Existence of Corner Equilibria

A strategy profile that would seem to be a natural candidate for equilibrium is one in which n groups receive the maximum (and "bliss") transfer rate until the credit ceiling is reached. If groups are fragmented and act myopically, this is what one might expect them to do. This section shows that this conjecture is incorrect, and there is no subgame perfect equilibrium in which transfers are at a "corner" as long as it is feasible.

More formally, the proposed strategy profile is:

$$g_{it} = \begin{cases} \bar{g} & \text{if } \frac{n\bar{g}}{r} > w_t > -\frac{n\bar{g}}{r} \\ -\bar{g} & \text{if } w_t = -\frac{n\bar{g}}{r} \end{cases} \tag{9}$$

When is this strategy profile a subgame perfect equilibrium? As argued in the previous section, it clearly is after wealth reaches $-\frac{\bar{g}n}{r}$; it only remains to check whether such strategies are best responses to one another for larger levels of wealth.

Suppose one group i expects all other $(n-1)$ groups to extract transfers following 9. For time $0 \leq t \leq T$ it then faces the budget constraint

$$\dot{w}_t = rw_t - (n-1)\,\bar{g} - g_{it} \tag{10}$$

To compute its best response group i must then maximize

$$-\left(\frac{1}{2}\right)\int_t^T \left\{(\bar{g} - g_{is})^2 + \psi r^2 \left(w_s - \frac{n\bar{g}}{r}\right)^2\right\} e^{-r(s-t)}dt + e^{-r(T-t)}U_{iT}^r \tag{11}$$

for all $0 \leq t \leq T$, where T is the first time the credit ceiling is reached (formally, $T = \sup_{t \geq 0} \left\{ w_t > -\frac{n\bar{g}}{r} \right\}$), subject to 10, $w_0 > 0$ given, and $w_T = -\frac{n\bar{g}}{r}$. Recall that U_{iT}^r is given by 5.

Let μ_t be the costate variable associated with state variable w_t. Necessary and sufficient conditions for a maximum arise from the solution to the system given by law-of-motion 10, w_0 given, $w_T = -\frac{n\bar{g}}{r}$, and

$$\bar{g} - g_{it} \geq \mu_t, \; 0 \leq t \leq T \tag{12}$$

$$\dot{\mu}_t = \psi r^2 \left(w_t - \frac{n\bar{g}}{r} \right), \; 0 \leq t \leq T \tag{13}$$

plus the transversality condition at T:[12]

$$\begin{aligned} 0 &= -\left(\frac{1}{2}\right) \left\{ \left(\bar{g} - g_{iT}\right)^2 + \psi r^2 \left(w_T - \frac{n\bar{g}}{r} \right)^2 \right\} \\ & \quad + \mu_T \left(r w_T - (n-1)\,\bar{g} - g_{iT} \right) + r U_{iT}^r \end{aligned} \tag{14}$$

From these conditions we can infer a condition for transfers equal to $g_{it} = \bar{g}$, $0 \leq t \leq T$, to be a best response on the part of group i. If it is, then we have an equilibrium with maximum (corner) transfers.

Suppose that such a transfer profile does indeed take place. Using $w_T = -\frac{n\bar{g}}{r}$, $g_{iT} = \bar{g}$, and the expression for U_{it}^r from 5, expression 14 can be rearranged to yield a terminal condition for the costate variable:

$$\mu_T = \frac{\bar{g}}{n} > 0 \tag{15}$$

Since 13 implies that the costate is always falling in the interval between times 0 and T (because $w_t < \frac{n\bar{g}}{r}$ for those t), it must be the case that μ_t takes on its lowest value at time 0. Hence, given that $\mu_T > 0$, all μ_t, $0 \leq t < T$, must also be positive.

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[12] For a derivation of this transversality condition, see Kamien and Schwartz [1981], Part I, Section 11 and Part II, Section 7. For an application in a similar problem, see Rustichini [1992]. The problem here is one of optimal control with a fixed terminal state $w_T = \frac{n\bar{g}}{r}$, a free terminal time T, and a salvage value U_{iT}^r. The interpretation of the transversality condition is that the terminal time should be chosen so that the Hamiltonian (which summarizes current and future utility prospects, in Dorfman's classsic interpretation) , plus the time derivative of the present value of the salvage term, must equal zero at T.

This means that $g_{it} = \bar{g}$ cannot be a best response to itself in the time interval between 0 and T: setting $g_{it} = \bar{g}$ implies driving the marginal utility of spending to zero; since the costate at all such points is positive, that would violate first order condition 12.

The intuition is the same as in any consumption- savings problem: in calculating their best response groups trade current against future transfers; the valuation of government wealth as a source of future transfers is summarized by the costate; as long as such value is positive, it cannot be optimal to transfer maximally today, thereby driving marginal utility to zero.

5 Constructing Interior Markov Equilibria

In this section and the next two construct decentralized fiscal policy equilibria in which budget deficits or surpluses emerge endogenously. I focus on simple Markovian strategies in which net transfers are a function of a state variable –in this case government wealth. And, in contrast to the previous section, such strategies are interior, since groups do not operate at maximum transfer levels.

Since the setting is linear-quadratic, I study policy rules such that actions are linear functions of the relevant state variable:

$$g_{it} = \begin{cases} \phi_t + \beta r w_t & \text{if } \frac{n\bar{g}}{r} \leq w_t < -\frac{n\bar{g}}{r} \\ -\bar{g} & \text{if } w_t = -\frac{n\bar{g}}{r} \end{cases} \tag{16}$$

where ϕ_t and β are two policy coefficients to be determined.[13] Notice that while ϕ_t is allowed to vary, β is assumed to be constant.[14]

As we did earlier, let T be the first time, if any, that the government hits its credit ceiling: $T = \sup_{t \geq 0} \left\{ w_t > -\frac{n\bar{g}}{r} \right\}$. Focus on the time interval $0 \leq t \leq T$. If all other $(n-1)$ groups are expected to use rule 16, the remaining ith group faces the budget constraint

$$\dot{w}_t = r w_t \left[1 - (n-1)\beta\right] - (n-1)\phi_t - g_{it}, \; 0 \leq t \leq T \tag{17}$$

[13]By free disposal, cases in which $w_t > \frac{n\bar{g}}{r}$ need not be considered.

[14]This assumption is not restrictive in that I am simply constructing equilibria in which strategies have this form. Whether other equilibria exist in which strategies are different is an open question.

To compute its best response group i must then maximize

$$(18)\quad -\left(\frac{1}{2}\right)\int_t^T \left\{(\bar{g}-g_{is})^2+\psi r^2\left(w_s-\frac{n\bar{g}}{r}\right)^2\right\}e^{-r(s-t)}dt+e^{-r(T-t)}U_{iT}^r$$

for all $t \leq T$, subject to 2, 17 and $w_0 > 0$ given. Characterizing this best response, and using the fact that all groups are symmetric, one can endogenously determine the optimal values of policy coefficients ϕ_t and β.

Let λ_t be the costate variable associated with state variable w_t. Necessary and sufficient conditions for an interior maximum are budget constraint 17 plus

$$(19)\qquad \bar{g}-g_{it}=\lambda_t,\ 0\leq t\leq T$$

$$(20)\qquad \dot{\lambda}_t=r\beta\,(n-1)\,\lambda_t+\psi r^2\left(w_t-\frac{n\bar{g}}{r}\right),\ 0\leq t\leq T$$

plus one of two transversality conditions. If T tends to infinity we have

$$(21)\qquad \lim_{T\to\infty}\lambda_T w_T e^{-rT}=0$$

while if T is finite we have[15]

$$\begin{aligned} 0 \;&=\; -\left(\frac{1}{2}\right)\left\{(\bar{g}-g_{iT})^2+\psi r^2\left(w_T-\frac{n\bar{g}}{r}\right)^2\right\} \\ (22)\qquad &\quad +\lambda_T\left(rw_T\left[1-(n-1)\,\beta\right]-(n-1)\,\phi_T-g_{iT}\right)+rU_{iT}^r \end{aligned}$$

The policy rule $g_{it}=\phi_t+\beta r w_t$ implies $\dot{g}_{it}=\dot{\phi}_t+\beta r\dot{w}_t$. Combining this with equations 17, 19 and 20 yields

$$(23)\qquad \dot{w}_t=rw_t\left[(n-1)\,\beta-\frac{\psi}{\beta}\right]+(n-1)\,(\phi_t-\bar{g})+n\bar{g}\left(\frac{\psi}{\beta}\right)-\frac{\dot{\phi}_t}{r\beta}$$

Application once again of the policy rule to 17 yields

[15] Once again, for a derivation of this transversality condition, see Kamien and Schwartz [1981], Part I, Section 11 and Part II, Section 7. For an interpretation and intuition, see the previous section, in which the same condition is used.

$$\dot{w}_t = rw_t\,[1 - n\beta] - n\phi_t \tag{24}$$

Equating coefficients on the term rw_t in equations 23 and 24 yields the quadratic equation

$$\beta^2\,(2n-1) - \beta - \psi = 0 \tag{25}$$

whose single positive root corresponds to the optimal value of the policy coefficient β. Notice that only the positive root makes economic sense, for otherwise transfers would be decreasing in the stock of government wealth.

Next, equating coefficients on the term involving ϕ_t yields the differential equation

$$\dot{\phi}_t = r\beta\,(2n-1)\,[\phi_t - \bar{g}\,(1 - n\beta)] \tag{26}$$

whose only steady state is $\phi = \bar{g}\,(1 - n\beta)$. Notice this differential equation is unstable around that steady state.

Differential equations 24 and 26 can also be expressed in terms of g_{it} and w_t. For the first one only need to undo the application of the policy rule:

$$\dot{w}_t = rw_t - ng_{it},\ 0 \leq t \leq T \tag{27}$$

For the second, again differentiate the policy rule with respect to time, and use 24 and 26. This yields.

$$\dot{g}_{it} = r\beta\,\{rw_t\,[1 - \beta\,(2n-1)] + (n-1)\,g_{it} - (2n-1)\,(1-n\beta)\,\bar{g}\} \tag{28}$$

Equations 27 and 28 constitute a system of two differential equations in two unknowns. The initial condition w_0 is given. The next two sections show that, for different values of ψ (to which correspond, in equilibrium, various initial conditions for g_{it} and terminal conditions for both g_{it} and w_t), this system of equations can give rise to two very different kinds of equilibria: one in which endogenous deficits occur and one in which endogenous surpluses occur.

Notice that the Markov strategies postulated in 16, whose policy coefficients we have just determined, and whose associated dynamics are given by the system of equations 27 and 28 (plus appropriate endpoint conditions), clearly give rise to a subgame perfect equilibrium: the strategies are, by construction, best responses to themselves, and these best responses have been constructed by allowing each group to reoptimize at each point in time. (Alternatively, subgame perfection obtains because the strategies are specified as a function of the state, not of time, so that they constitute best responses in the subgame beginning at any arbitrary level of the state.)

6 Endogenous Budget Deficits: The Case of Prodigal Transfers

In this section I construct a Markovian equilibrium in which sustained fiscal deficits endogenously occur and, as a consequence, the government reaches its credit limit in finite time.

It is convenient to construct the equilibrium backwards, starting with the terminal conditions. We know that if the credit ceiling is reached we have $w_T = -\frac{n\bar{g}}{r}$. What about g_{iT}? Take first order condition 19 evaluated at T, $w_T = -\frac{n\bar{g}}{r}$ and U^r_{iT} from 5 and substitute them into transversality condition 22. That yields the quadratic equation

$$(2n-1)\left(g_{iT}\right)^2 + (2n\bar{g})\, g_{iT} - (2n-3)\, \bar{g}^2 = 0$$

whose roots are $g_{iT} = \left\{-\bar{g}, \bar{g}\left(\frac{2n-3}{2n-1}\right)\right\}$. Since both roots satisfy the requirement $-\bar{g} \leq g_{iT} \leq \bar{g}$, they are both admissible. Hence we have two possible equilibrium trajectories, each corresponding to a terminal condition for transfers.

Next I characterize the possible dynamics of the system 27 and 28, which will yield the initial condition g_{i0} (w_0 is given). Notice first that the unique steady state of this system is given by $g_i^{ss} = \bar{g}$ and $w^{ss} = \frac{n\bar{g}}{r}$. Notice also that, because the term $[1-\beta(2n-1)]$ multiplying w_t in equation 28 can easily be shown to be negative, the system given by equations 27 and 28 has two positive (and real) roots; hence, the system is unstable around its unique steady state.

Figure 1 depicts possible equilibrium dynamics. Only the shaded area is admissible: because the initial condition w_0 is below the steady state level by assumption, g_{i0} must also be below the steady state level in order to be feasible; in addition, both w_t and g_{it} must be above their allowable minima. We know the terminal condition is either at point A$=\left(-\frac{n\bar{g}}{r}, \bar{g}\left(\frac{2n-3}{2n-1}\right)\right)$ or at point B$=\left(-\frac{n\bar{g}}{r}, -\bar{g}\right)$. The initial position of the system must be at a point such as C or D, where w_0 is given and g_{i0} follows from the need to reach a terminal condition at time T. Clearly, initial transfers must be higher in the case in which $-\bar{g}$ is the terminal condition for transfers, given that both trajectories must satisfy the same present value budget constraint and end at the same level of government wealth. In both cases w_t declines monotonically throughout, for it starts and ends above the $\dot{w}_t = 0$ line. Transfers are such that there is a budget deficit over the whole time interval between 0 and T, and the government reaches its credit limit precisely at this latter time.

The trajectory of spending on transfers is interesting. Notice first, that there is overspending relative to the planner's solution, for the planner would choose, for any arbitrary initial wealth $-\frac{n\bar{g}}{r} < w_0 < \frac{n\bar{g}}{r}$, a path for transfers such that wealth either increases or remains constant. Notice also that, in the case of $g_{iT} = -\bar{g}$ transfers are obviously negative at the terminal time; by continuity of the equilibrium trajectories, g_{it} must be negative in the neighborhood of the terminal time as well. In other words, in that case transfers start out large and positive, they shrink over time, and become negative (groups begin paying taxes) before the credit ceiling is reached.

We can summarize the results of this section in the following way. Equilibria exist in which each group demands prodigal transfers, large enough to cause fiscal deficits and a sustained decline in government wealth (equivalently, a sustained increase in government debt). Eventually, the government hits its credit ceiling, and is locked forever in a position of paying sufficient taxes to service the associated maximal debt level.

The intuition for these results is simple. Property rights are not defined over each group's share of overall revenue or assets. A portion of any government wealth not spent by one group will be spent by the other group. Hence, there are incentives to raise net transfers above the collectively efficient rate. As in the "tragedy of the commons" literature, this leads to overspending (here, excessively large transfers) and overborrowing relative to the planner's solution.

The intuition for the existence of multiple equilibrium paths is closely related. Since one group's optimal transfer level is decreasing in the expected rate of return on government wealth (heuristically, higher return means larger savings given the assumed preferences), and since this rate of return is decreasing in the transfer level demanded by others, strategic complementarity occurs: higher expected transfers by $(n-1)$ groups elicit higher transfers by the remaining nth group, and viceversa.

7 Endogenous Budget Surpluses: The Case of Frugal Transfers

Does decentralized fiscal policymaking always lead to budget deficits? No. In this section I construct an equilibrium where, ψ is large enough so that groups care strongly about having high levels of government wealth, decentralized fiscal policymaking still leads to overspending, but this overspending is mild enough that the trajectory for debts and deficits is qualitatively the same as that chosen for the planner –in particular, fiscal surpluses occur and government wealth converges to the level $\frac{n\bar{g}}{r}$, which can sustain "bliss" transfers $\bar{g}$.

As before, I construct the equilibrium starting from the terminal condition and proceed backwards. The Markovian policy rule 16 still holds. In particular, it implies that $g_{it} = \phi_t + \beta r w_t$ must yield $\bar{g} = \phi_t + \beta r \left(\frac{n\bar{g}}{r}\right)$, for transfers must achieve their bliss level when wealth becomes sufficiently large to finance them. This clearly means that, at that point, the term ϕ_t must be constant. But inspection of differential equation 26, which is unstable around its steady state, reveals that ϕ_t can only be constant at some point in time if it is constant throughout –that is, if it starts at its steady state. Hence, our first result is that, in this equilibrium,

$$\phi_t = \phi = \bar{g}\,(1 - n\beta)\ \ \forall t \geq 0 \tag{29}$$

Combining this with the fact that the optimal value of the policy coefficient β is still given by the positive root of quadratic equation 25, we have that each group's policy rule is

$$g_{it} - \bar{g} = \beta r \left(w_t - \frac{n\bar{g}}{r}\right)\ \ \forall t \geq 0 \tag{30}$$

How does transfer behavior in this case compare with that under the planner? Notice that the definition of β implies that $\gamma > \beta$ for all non-negative ψ. Because $\gamma > \beta$, a comparison of 7 and 30 readily yields the result that transfers are higher under decentralized policymaking than under the planner's rule as long as wealth is below its bliss level $\frac{n\bar{g}}{r}$.

What about the effect on the budget? Substituting 30 into 1 we obtain

$$\dot{w}_t = r\,(1 - n\beta)\left(w_t - \frac{n\bar{g}}{r}\right)\ \ \forall t \geq 0 \tag{31}$$

It is easy to show that there is a level of ψ (call it $\widehat{\psi} \equiv \frac{n-1}{n^2}$) such that $1 - n\beta \leq 0$ if $\psi \geq \widehat{\psi}$. If this condition holds with strict inequality, there is a budget surplus and $\dot{w}_t > 0$ as long as $w_t < \frac{n\bar{g}}{r}$. The bliss level of wealth $w = \frac{n\bar{g}}{r}$ is achieved asymptotically.[16] It is obvious, since the shadow value of wealth goes to zero asymptotically, that in this case transversality condition 21 is satisfied.

Notice, on the other hand, that if $0 \leq \psi < \widehat{\psi}$, so that $1 - n\beta > 0$, the transfer policy in 30 does not give rise to an admissible trajectory. In that case there is a permanent deficit and the level of wealth goes to minus infinity as time goes to infinity. Given 30, this means that transfers would eventually have to become arbitrarily large and negative, violating the assumption that there is a maximum tax each group can pay.

Endogenous budget deficits do not occur here simply because we have restricted attention to cases in which ψ is above a certain threshold, so that groups care strongly about the actual level of government wealth. But recall that, while under the planner it was sufficient for $\psi > 0$ for it to be optimal to generate fiscal surpluses, here surpluses occur only if $\psi > \widehat{\psi} > 0$. In other words, there is also a "deficit bias" in this case, even though actual deficits do not occur in equilibrium.

Notice, finally, that there exists a second type of multiplicity of equilibrium. An equilibrium with deficits (of the kind constructed in the previous section) can occur for any finite level of ψ, while an equilibrium with surpluses can only occur if $\psi > \widehat{\psi}$. Hence, for the range $\psi > \widehat{\psi}$ both types of equilibrium are feasible, and which occurs depends only on expectations. Once again, the intuition has to do with the strategic complementarity in groups desired transfers, with higher expected transfers by $(n-1)$ groups eliciting higher transfers by the remaining nth group, and viceversa.

8 Conclusions

Economists have spent much time and energy modelling the allocation of resources in those regions of the modern economy where the market system indeed does allocate resources. But there is a very large portion of such economies –the government sector– within which there are no private

[16]Or, the borderline case of $\psi = \widehat{\psi}$ and $1 = n\beta$, wealth is constant throughout.

property rights, and where the allocation of resources does not follow market forces. If we move beyond the view of government as a monolithic entity that behaves like a single individual, economics must provide an account of how economic decisions are made among government groups, and how politics both frames and determines those decisions.

This paper suggests one of the simplest possible models of a government with many controllers –one in which government net income is a "commons" from which interest groups can extract resources. This setup has striking macroeconomic implications. Transfers are higher than a benevolent planner would choose them to be; fiscal deficits emerge even when there are no reasons for intertemporal smoothing, and in the long run government debt tends to be excessively high; peculiar time profiles for transfers can emerge, with high positive net transfers early on giving way to high taxes later on; multiple dynamic equilibria can occur, with the same initial government wealth being associated to radically different trajectories for transfers and deficits All these results emerge exclusively from the strategic interaction among competing groups, in a context in which fiscal policymaking is decentralized and interest groups have open access to government resources.

References

[1] Aizenman, Joshua, "Competitive Externalities and the Optimal Seigniorage Segmentation," *Journal of Money, Credit and Banking*, XXIV (1992), 61-71.

[2] Alesina, Alberto and Allan Drazen, "Why Are Stabilizations Delayed?" *American Economic Review*, CXXXI (1991), 1170-1188.

[3] Alesina, Alberto and Roberto Perotti, "The Political Economy of Budget Deficits," NBER Working Paper No. 4637, February 1994.

[4] Alesina, Alberto , Ricardo Hausmann, Rudolph Hommes and Ernesto Stein, "Budget Institutions and Fiscal Performance in Latin America," NBER Working Paper No. 5586, May 1996.

[5] Atkeson, Andrew, "International Lending with Moral Hazard and Risk of Repudiation," *Econometrica*, CIX (1991), 1069-1090.

[6] Barro, Robert, "On the Determination of the Public Debt," *Journal of Political Economy*, CXXXVII (1979), 940-971.

[7] Barro, Robert, "U.S. Deficits since World War I," *Scandinavian Journal of Economics*, CXXXVIII (1986), 195-222 .

[8] Benhabib, Jess and Roy Radner, "The Joint Exploitation of a Productive Asset: A Game Theoretic Approach," *Economic Theory*, II (1992), 155-190.

[9] Bomfin, A.N. and Anwar Shah "Macroeconomic Management and the Division of Powers in Brazil: Perspectives for the 1990s," World Bank Working Paper No. 567, January 1991.

[10] Buiter, Willem, Giancarlo Corsetti and Nouriel Roubini, "Excessive Deficits: Sense and Non-Sense and the Treaty of Maastricht," *Economic Policy*, No. 16, (1993), 57-100.

[11] Bulow, Jeremy and Kenneth Rogoff "Sovereign Debt: Is to Forgive to Forget?" *American Economic Review*, CXXIX (1989) 43-50.

[12] Bizer, Daniel and Steven Durlauf, "Testing the Positive Theory of Government Finance," *Journal of Monetary Economics*, XXVI (1990), 123-141.

[13] Chari, V.V. and Patrick Kehoe, "Sustainable Plans and Debt," *Journal of Economic Theory*, CXI (1993a), 230-261.

[14] Chari, V.V. and Patrick Kehoe, "Sustainable Plans and Mutual Default," *Review of Economic Studies* CX (1993b), 175-195.

[15] Chari, V.V. and Harold Cole, "A Contribution to the Theory of Pork Barrel Spending," Federal Reserve Bank of Minneapolis Staff Report 156, 1993c.

[16] Chari, V.V., Larry Jones and Ramón Marimón, "On the Economics of Split Voting in Representative Democracies," paper presented at the NYU Conference on Political Economy, May 1994.

[17] Cukierman, Alex, Sebastian Edwards and Guido Tabellini, "Seigniorage and Political Instability," NBER Working Paper No. 3199, 1989.

[18] Edwards, Sebastian and Guido Tabellini, "Explaining Fiscal Policies and Inflation in Developing Countries," *Journal of International Money and Finance,* X (1991), S16-S48.

[19] Friedman, Albert, *Differential Games*, New York: Wiley Interscience, 1971.

[20] Holzmann, Robert, "Budgetary Subsidies in Centrally Planned Economies in Transition " IMF Working Paper 91/11, April 1991.

[21] Jones, Mark, Pablo Sanguinetti and Mariano Tommasi, "Politics, Institutions and Fiscal Performance in the Argentine Provinces," Mimeo, Universidad de San Andrés, June 1997.

[22] Kamien, Morton and Nancy L. Schwartz, *Dynamic Optimization: The Calculus of Variations and Optimal Control in Economics and Management.* Amsterdam: North Holland, 1981.

[23] Kornai, Janos, "Demand versus Resource- Constrained Systems" *Econometrica* XXXXVII (1979), 801-820.

[24] Larraín, Felipe and Marcelo Selowsky, *The Public Sector and the Latin American Crisis*, San Francisco: ICS Press, 1991.

[25] Levhari, David and Leonard Mirman, "The Great Fish War: An Example Using the Cournot Nash Solution," *Bell Journal of Economics,* XI (1980), 322-334.

[26] Lipton, David and Jeffrey Sachs, "Creating a Market Economy in Eastern Europe: The Case of Poland," *Brookings Papers on Economic Activity*, (1990).

[27] Persson, Torsten and Lars Svensson, "Why a Stubborn Conservative Would Run a Deficit: Policy with Time-Inconsistent Preferences," *Quarterly Journal of Economics,* LIV (1989), 225-245.

[28] Roubini, Nouriel and Jeffrey Sachs, "Government Spending and Budget Deficits in the Industrial Countries, " *Economic Policy* No. 8, (1989), 100-132.

[29] Roubini, Nouriel, "Economic and Political Determinants of Budget Deficits in Developing Countries," *Journal of International Money and Finance,* X (1991), S49-S72.

[30] Rustichini, Aldo, "Second Best Equilibria for Games of Joint Exploitation of a Productive Asset," *Economic Theory,* II (1992), 191-196.

[31] Sachs, Jeffrey, "Russia's Struggle with Stabilization: Conceptual Issues and Evidence," Paper presented at the World Bank's Annual Conference on Development Economics, April 1994.

[32] Shah, Anwar, "The New Federalism in Brazil," World Bank Working Paper No. 557, December 1990.

[33] Stein, Ernesto, Ernesto Talvi and Alejandro Grisanti, "Institutional Arrangements and Fiscal Performance: The Latin American Experience," Mimeo, Office of the Chief Economist, Inter-American Development Bank, June 1997.

[34] Tornell, Aaron and Andrés Velasco, "The Tragedy of the Commons and Economic Growth: Why Does Capital Flow from Poor to Rich Countries? *Journal of Political Economy* L (1992), 1208-1231.

[35] Tornell, Aaron and Andrés Velasco, "Exchange Rate-Based and Money-Based Stabilization with Endogenous Fiscal Policy," NBER Working Paper No. 5300, October 1995.

[36] Velasco, Andrés, "A Model of Endogenous Fiscal Deficits and Delayed Fiscal Reforms," in James Poterba and Jurgen Von Hagen (eds.), *Budget Institutions and Fiscal Performance*. Chicago: University of Chicago Press for the NBER, forthcoming 1998.

[37] von Hagen, Jurgen, "Budgeting Institutions and Fiscal Performance in the European Communities," Economic Papers No. 96, Commission of the European Communities, October 1992.

[38] von Hagen, Jurgen and Ian Harden, "National Budget Processes and Fiscal Performance," *European Economy: Reports and Studies* 3, 1994.

[39] Wallich, C., "Fiscal Decentralization: Intergovernmental Relations in Russia," Studies of Economies in Transformation, Paper No. 6, The World Bank, 1992.

[40] Weingast, Barry, Kenneth Shepsle and Christian Johnsen, "The Political Economy of Benefits and Costs: A Neoclassical Approach to Redistributive Politics," *Journal of Political Economy* CXXXIX (1981), 642-664.

[41] World Bank, "Argentina: Reforms for Price Stability and Growth," The World Bank, 1990a.

[42] World Bank, "Argentina: Provincial Government Finances," The World Bank, 1990b.

[43] World Bank, "Tax Policy for Stabilization and Economic Recovery," The World Bank, 1990c.

[44] Zarazaga, Carlos, "Hyperinflations and Moral Hazard in the Appropriation of Seigniorage," Working Paper 93-26, Federal Reserve Bank of Philadelphia, November 1993.